REMARKS

The enclosed is responsive to the Examiner's Office Action mailed on March 17, 2010. By way of the present response applicants have: 1) amended claims 1-4, 6-16, and 43; 2) added no claims; and 3) canceled no claims. Applicants respectfully submit that the amendments to claim 1 are supported by the specification as originally filed – e.g., at least on pages 18-21. No new matter has been added. Dependent claims 2-4, 6-16, and 43 have been amended to correct "a claim" to "the claim."

An RCE accompanies this Amendment. Reconsideration of this application as amended is respectfully requested.

Claim Rejections – 35 U.S.C. § 103

Claims 1-4, 6, 8-16 and 43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,521,819 by Greenwood, (hereinafter, "Greenwood") in view of European Patent No. EP 0 925 992 A2 by Nobutaka (hereinafter, "Nobutaka) and further in view of U.S. Patent No. 4,680,595 by Henry, (hereinafter, "Henry").

Applicants respectfully submit that Greenwood does not teach or suggest a combination with Nobutaka and that Nobutaka does not teach or suggest a combination with Greenwood. The combination of Greenwood and Nobutaka is the result of impermissible hindsight based solely upon the present application.

Greenwood describes a method of controlling a continuously variable ratio transmission including a variator. Nobutaka, however, is concerned with the control of a different type of transmission that teaches away from Greenwood and the

subject matter of the present application. Greenwood describes a torque-controlled transmission. Nobutaka describes a ratio-controlled transmission. The two types of transmissions work in very different ways.

Nobutaka states that the "axes of rotation of the rollers are offset by the servo valve system and the stepping motor, which are disclosed in US-A5083473, in response to the ratio actuator command signal." (Nobutaka, paragraph [0065]). The system in Nobutaka includes servo control of the roller inclination (corresponding to variator drive ratio). An electronic input determines where the rollers are to be positioned. The servo valve and stepping motor together sense the actual roller position and adjust it toward the required position. Hence the electronics associated with the transmission can directly set the transmission ratio. (*see* Nobutaka, paragraphs [0060]-[0065]). One may assume that the control of a vehicle transmission (manual, stepped automatic, or CVT) will involve selecting and directly setting the drive ratio. However, that assumption is not appropriate for a torque-controlled transmission.

In a torque-controlled transmission, the control signal does not directly determine transmission ratio. Instead, it determines the torques created by the variator at its input and output. The variator permits its own ratio to change as the torques it creates, added to externally imposed torques from the engine and wheels, cause the engine and vehicle to accelerate/decelerate. For example, if the vehicle driver applies the brakes to slow the vehicle, the drive ratio provided by the transmission as a whole, and specifically by the variator, will have to change. This could, however, be achieved without any change to the primary control signal – as the vehicle slows, the variator automatically accommodates the resultant change in

drive ratio. It goes on creating the reaction torque determined by the primary control signal while the positions of the variator rollers and the resultant ratio vary as necessary.

There are challenges associated with the control of a torque-controlled transmission which do not arise in connection with more conventional transmissions in which direct control is exercised over ratio. For example, when using a ratio-controlled transmission, there is a direct correspondence between vehicle speed and engine speed, as determined by the chosen transmission ratio. Control of the engine speed is thus relatively straightforward. However, engine speed control is wholly different in a torque-controlled transmission. There is no direct way to establish a relationship between engine speed and vehicle speed. Instead, as explained in the present application, engine speed control depends on management of the dynamic balance between torque created by the engine and torque created at the variator input applied to the engine by the variator. A net imbalance between the two will cause acceleration and failure to manage such an imbalance would result in an uncontrolled variance in engine speed.

Nobutaka describes choosing a target transmission ratio based upon a target engine speed and using a mathematical delay function to adjust the transmission along a controlled path. (*see* Nobutaka paragraphs [0069]-[0092]). The "inertia torque" can be calculated and the engine setting can be modified so that the application of this inertia torque does not create unwanted deviations in the torque experienced by the driver. Such a process is not carried out with a torque-controlled transmission and is dissimilar from the present application. A torque-controlled transmission does not, in the direct way contemplated by Nobutaka, impose a profile

upon changes in transmission ratio. Instead, as described above, a torque-controlled transmission, as described in Greenwood and in the present application, depends upon the management of the dynamic balance of engine torque and loading torque at the engine-transmission interface.

In response to the previous submission of arguments against the combination of Greenwood and Nobutaka, the Examiner argues that it would be advantageous to combine Nobutaka with Greenwood "to operate the control system when the driver's demand changes so as to effect a smooth and rapid change from one steady state according to the operative engine map to another when demanded by the operator." (Office action dated 3/17/10, page 11). The Examiner continues by arguing that both references are directed to a control system of drivelines including a continuously variable transmission (CVT). Applicants do not disagree that both references describe CVT's. As noted above, however, applicants respectfully submit that the two references deal two types of CVT's that work in very different ways: Greenwood describes a torque-controlled transmission while Nobutaka describes a ratio-controlled transmission. In a ratio-controlled transmission, it is possible to created unwanted torques at the vehicle wheels by adjusting the transmission ratio. For example, a down-shift in ratio causes a drop in torque at the driven wheels, as power goes to accelerating inertia in the drive train, and an up-shift of transmission ratio causes the opposite effect. (Nobutaka, paragraph [0003]). These effects can be disconcerting to the driver if not suitably controlled and Nobutaka describes a process for controlling changes in transmission ratio to manage them. Applicants respectfully submit, however, that this solution offered by Nobutaka is not compatible with torque-controlled transmission. Accordingly,

applicants respectfully submit that the Examiner has failed to articulate a rational underpinning for the combination of Greenwood and Nobutaka.

Additionally, applicants respectfully submit that Greenwood does not teach or suggest a combination with Henry and that Henry does not teach or suggest a combination with Greenwood. The combination of Greenwood and Henry is the result of impermissible hindsight based solely upon the present application.

Henry describes an emulation system (a dynamometer) for a motor vehicle drive train. The system in Henry connects directly to the engine - "no transmission is installed between the engine and the dynamometer." (Henry, col. 1, lines 67-68). In its brief consideration of a transmission for the purpose of emulation, Henry describes a conventional multiple gear ratio automatic transmission, not a torque-controlled transmission (Henry, col. 3, lines 2-5). Henry describes prediction of changes in wheel speed only to an extent that the dynamometer can simulate driving conditions. Henry, however, does not describe controlling a drive train. The Examiner alleges that it would be obvious to combine Henry with Greenwood "for the purpose of enhancing the accuracy of the overall system." (Office action dated 3/17/10, page 4). Applicants respectfully disagree and submit that a system for controlling a dynamometer, based upon a drive train including an emulated conventional multiple gear ratio automatic transmission, is not compatible with and would not enhance the accuracy of controlling a torque-controlled transmission as described in Greenwood. Accordingly, applicants respectfully submit that the Examiner has failed to articulate a rational underpinning for the combination of Greenwood and Henry.

Even if the references were combined, applicants respectfully submit that that the combination of Greenwood, Nobutaka, and Henry would fail to disclose:

> determining a target engine speed on the basis of an input provided by a driver;
> determining a difference between an actual engine speed and the target engine speed;
> determining from the difference between an actual engine speed and the target engine speed a target engine acceleration.

(Amended claim 1).

Applicants have previously argued that the combination of references fails to disclose determining a target engine acceleration. The Examiner alleges that Greenwood discloses "determining a target engine acceleration" at least at col. 3, lines 22-28. Applicants respectfully disagree. Greenwood states:

> As is evident from FIG. 2, the magnitude of the engine torque at point C is considerably greater than what is called for (T.sub.B) at point B, the amount of the excess being set by the predetermined choice of the slope of the lines 17. **The torque excess will start to accelerate the engine from speed N.sub.A at point A to the desired new speed N.sub.B at point B.** However, according to invention, as the speed does rise from A to B the excess torque falls, from point C down line 17B, until T.sub.E and N.sub.E reach the demanded new equilibrium at point B.

(Greenwood, col. 3, lines 20-28) (emphasis added).

This passage from Greenwood describes accelerating an engine, but does not disclose determining a target engine acceleration. Greenwood's description is focused on a desired **speed**, not the determination of ***a target engine acceleration***. In response to the previous arguments, the Examiner states that "[d]esired engine speed is construed as target engine speed, and by accelerating the engine speed from one point to another, that is construed as ***determining an engine speed***." (Office Action dated 3/17/10, page 12) (emphasis added). Applicants respectfully

submit that the Examiner appears to have overlooked the fundamental difference between speed and acceleration. If the Examiner intended to allege that Greenwood's passage was construed as determining an engine acceleration, applicants respectfully disagree and submit that a number of different accelerations could accelerate an engine from a first speed to a second speed and that Greenwood is silent regarding the determination of a target acceleration.

Similarly, Nobutaka describes an operator signal from the accelerator pedal being input into a "target speed generator." (Nobutaka, paragraph [0069]) (emphasis added). Henry describes a desired (simulated) engine speed, not a target engine acceleration. The combination of references is focused on adjustments based upon a chosen engine speed target, not determining a target engine acceleration.

Furthermore, applicants have amended the claim language to clarify that the target engine acceleration is determined from the difference between an actual engine speed and a target engine speed. Applicants respectfully submit that the combination of Greenwood, Nobutaka, and Henry fails to disclose this claim feature.

Given that the combination of references fails to disclose determining a target engine acceleration, applicants respectfully submit that it follows that the combination of Greenwood, Nobutaka, and Henry would also fail to disclose:

> ***determining values*** of the variator's primary control signal and of an engine torque demand ***for providing the target engine acceleration*** and a wheel torque which is based on the input provided by the driver;
> setting the variator's primary control signal and the engine torque control ***based on the values***.

(Amended claim 1) (emphasis added).

The failure of the combination of references to disclose determining a target

engine acceleration leads to a failure to determine values for providing the target engine acceleration and, in turn, setting controls based on the determined values.

In response to the Examiner's allegation that applicants' arguments include features that are not claimed, applicants respectfully disagree. Applicants arguments track the language of claim 1.

Applicants further submit that the combination of Greenwood, Nobutaka, and Henry would also fail disclose:

> predicting a consequent engine speed change resulting from the setting of the variator's primary control signal and the engine torque control.

(Amended claim 1).

Greenwood describes comparing instantaneous values of actual engine speed with a desired engine speed, but is silent regarding a prediction of engine speed change resulting from the setting of the variator's primary control signal and the engine torque control.

The Examiner relies upon Nobutaka paragraph [0067] in the allegation of obviousness. Nobutaka paragraph [0067] states:

> A preferred implementation of the present invention can be understood with reference to the control diagram of FIG. 4. The operator signal from the accelerator pedal on line 300 is used as the input to a power request command generator 302. The power request command generator 302 may be as simple as a look-up table in the controller memory. The power request command generator 302 outputs a power command signal on line 304. The power command signal on line 304 is input into a throttle command generator 306. A measure of actual engine speed on line 308 is also input into the throttle command generator 306. The throttle command generator 306 generates, as a function of power command and actual engine speed, a throttle position command on line 310. The throttle command generator 306 may be a two-dimensional look-up table in

> the controller memory. The throttle position command on line 310 is input into a summation block 312, which corrects the throttle position command with a throttle angle correction on line 314. The summation block 312 outputs a corrected throttle position command on line 316. The corrected throttle position command on line 316 is input into comparison block 318, which compares the actual throttle position on line 320 with the corrected throttle position command on line 316 and outputs a throttle error signal on line 322.

Applicants respectfully submit that there is no disclosure, teaching, or suggestion of prediction of an engine speed change in this passage. Rather, it describes how throttle position is controlled as a function of "power command" and of the actual engine speed. Applicants respectfully submit that this is irrelevant to prediction of an engine speed resulting from the setting of the variator's primary control signal and the engine torque control.

Henry describes predicting a simulated engine speed - i.e., Henry computes an engine speed that would occur if the engine were connected to a drive train and vehicle. Henry, however, deals with a dynamometer in a test environment that simulates a conventional automatic transmission and does not disclose a prediction of engine speed change resulting from the setting of the variator's primary control signal and the engine torque control.

Applicants further submit that the combination of Greenwood, Nobutaka, and Henry would also fail disclose:

> comparing the actual engine speed with the predicted engine speed; and
>
> adjusting the settings of the variator's primary control signal or of the engine torque control based on the comparison of the actual and predicted engine speeds to bring the actual engine speed toward the predicted engine speed.

(Amended claim 1).

In response to applicants' previous arguments, the Examiner states that the applicant relies on features that are not claimed – "(i.e., prediction of engine speed change resulting from adjusting variator and engine torque controls based upon the target acceleration) are not recited ... [t]he claim recites ONLY 'the adjusting variator and engine torque control.'" (Office action dated 3/17/10, page 12). Applicants respectfully disagree. The claim previously recited "predicting a consequent engine speed change resulting from the adjusting the variator's primary control signal or the engine torque control" and now recites the slightly varied "predicting a consequent engine speed change resulting from the setting of the variator's primary control signal and the engine torque control." (Claim 1). It appears that the Examiner takes issue with the argued "based upon the target acceleration." Applicants respectfully submit that the claimed setting of the controls is based on determined values to provide the target engine acceleration. The use of antecedent basis connects claim terms used throughout the features of the claim. The prediction of engine speed change results from the settings, wherein said settings are to provide the target engine acceleration. Applicants respectfully request that Examiner examine the claim as a whole rather than isolating connected claim features.

Greenwood describes comparing instantaneous values of actual engine speed with a desired engine speed and varying a fuel supply to bring the two into agreement, but is silent regarding a prediction of engine speed change resulting from the setting of the variator's primary control signal and the engine torque control. Accordingly, it follows that Greenwood is silent regarding comparing the actual engine speed ***with the predicted engine speed*** and adjusting the settings of the

variator's primary control signal or of the engine torque control ***based on said comparison***.

The Examiner alleges that correction of the claimed settings based on a comparison of actual and predicted engine speeds is taught in Nobutaka paragraphs [0067]-[0069]. Nobutaka paragraph [0067] is quoted above. Nobutaka paragraphs [0068]-[0069] state:

> The throttle error signal is input into throttle control loop 324, which controls the position of the throttle 1a. The throttle control loop 324 may consist of a PID controller, but not limited to such a controller. The actual throttle position represented by line 320 controls the torque output of the engine, represented by block 326. The output power of the engine 326, represented by line 328, affects the vehicle driveline dynamics, represented by block 330.
>
> The operator signal from the accelerator pedal on line 300 is also input into target speed generator 332. A measure of actual vehicle speed (VSP) on line 334 is also input into target speed generator 332. The target speed generator 332 generates, as a function of the operator signal from the accelerator sensor 9 and actual vehicle speed (VSP), a target CVT input speed signal (Ni) on line 336. The target speed generator 332 may be a two-dimensional look-up table in the controller memory. FIG. 6 illustrates one example of the relation between data in this two-dimensional table. The target CVT input speed (Ni) on line 336 is input into target ratio generator 338. The actual vehicle speed on line 334 is also input into target ratio generator 338. The target ratio generator 338 computes a target ratio (Gt) as a function of the CVT input speed and the actual vehicle speed and outputs target ratio signal (Gt) line 340. The function can be expressed as,
>
> Gt=k1.multidot.Ni/Vsp Eq. 2
>
> where: k1 is a constant that is used to convert the ratio Ni/Vsp to a rotational speed ratio of input discs 234, 240 and output discs 236, 242.

Applicants respectfully submit that there is no disclosure, teaching, or suggestion in these paragraphs of comparing the actual engine speed with the predicted engine speed or that the settings of the variator's primary control signal or of the engine torque control based on the comparison are adjusted on the basis of said comparison. Nobutaka describes correcting throttle position and computing a target ratio as a function of a target input speed and the actual vehicle speed. Applicants respectfully submit that this is irrelevant to the present claims. The target CVT input speed signal generated by the target speed generator is not a predicted engine speed.

While Henry describes a predicted speed, it is described in a very different context than claim 1. Henry is not concerned with a process for controlling a motor vehicle drive train. Instead, Henry is focused on a process by which a behavior of a drive train is modeled in order to control a dynamometer. Henry is silent regarding a ***prediction of engine speed*** change resulting from the setting of the variator's primary control signal and the engine torque control, comparing the actual engine speed ***with the predicted engine speed***, and adjusting the settings of the variator's primary control signal or of the engine torque control ***based on said comparison***.

Accordingly, applicants submit that the rejection of claim 1 has been overcome.

Given that claims 2-4, 6, 8-16, and 43 are dependent upon claim 1, and include additional features, applicants respectfully submit that the rejection of claims 2-4, 6, 8-16, and 43 has been overcome for at least the reasons set forth above.

Claim 7 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Greenwood in view of Nobutaka and further in view of Henry and U.S. Patent No. 6,418,366 by Danz, (hereinafter, "Danz").

Given that claim 7 is dependent upon claim 1, and includes additional features, and given that Danz fails to remedy the shortcomings of Greenwood, Nobutaka, and Henry set forth above, applicants respectfully submit that the rejection of claim 7 has been overcome for at least the reasons set forth above.

CONCLUSION

Applicants respectfully submit that in view of the amendments and arguments set forth herein, the applicable objections and rejections have been overcome. Applicants reserve all rights under the doctrine of equivalents.

Pursuant to 37 C.F.R. 1.136(a)(3), applicants hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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